

MAY 5 2005

**STORM WATER SAMPLING PLAN
K. HOVNANIAN AT UPPER UWCHLAN, LLC
BYERS STATION RESIDENTIAL DEVELOPMENT
UPPER UWCHLAN TOWNSHIP, CHESTER COUNTY, PENNSYLVANIA
AND
K. HOVNANIAN AT NORTHAMPTON, LLC
WOODS AT NORTHAMPTON RESIDENTIAL DEVELOPMENT
NORTHAMPTON TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA**

Prepared for:

K. Hovnanian at Upper Uwchlan, LLC

and

K. Hovnanian at Northampton, LLC

May 2005

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water & Environmental Engineering Services
426 Brandywine Parkway
West Chester, PA 19380

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1.0 BACKGROUND

Leggette, Brashears & Graham, Inc. (LBG) was retained to prepare and implement a storm water sampling plan (Sampling Plan) for the Byers Station residential development located along Route 100 in Upper Uwchlan Township, Chester County (Figure 1), and for the Woods at Northampton residential development located in Northampton Township, Bucks County, Pennsylvania (Figure 2). Site plans for Byers Station and the Woods at Northampton are provided in Figures 3 and 4, respectively. Preparation and execution of the Sampling Plan was requested pursuant to a Section 308 request made by the United States Environmental Protection Agency (USEPA), Region III. This Sampling Plan also outlines the measures to be taken to protect the integrity of the data being collected during all monitoring activities. The quality assurance/quality control procedures outlined herein are designed to maintain the highest quality of data and to ensure an acceptable level of precision and accuracy.

2.0 PROJECT SCHEDULE

Monitoring activities have been recommended by the USEPA to be completed within a period of two months following receipt of written approval of the Sampling Plan by USEPA, with the primary goal of collecting water quality data during four storm events. Due to the unpredictable nature of weather-related events, an exact monitoring schedule can not be planned at this time. However the study will be conducted in accordance with the following proposed schedule:

1. Receipt of USEPA's written notice to proceed – Day One;

2. Monitoring equipment acquisition, installation, and testing – Days 1 through 10;
3. Collection of flow, rainfall and water quality data during four storm events over a two month time period (weather permitting);
4. Preparation of a report and transmittal to USEPA (weather permitting) – Day 60.

If four storm events do not occur in this time period, we will prepare a report on the data collected by the Sampling Plan by the 40th day, and submit a report to USEPA by the 60th day on the data collected. This allows time for the required two week sampling analysis turnaround.

3.0 MONITORING EQUIPMENT INSTALLATION

The sample locations at Byers Station and the Woods at Northampton have been selected based on the size of the sedimentation basins. The outfall for the basin with the largest drainage area at each development was selected as a sample location. The discharge from Temporary Sedimentation Basin (TSB) 3B at Byers Station which has an estimated drainage area of 15.5 acres will be monitored. The sample location of the discharge from TSB 3B is shown in Figure 5. The discharge from Sedimentation Basin B (SB B) at the Woods at Northampton which has an estimated drainage area of 20.2 acres will also be monitored. An estimated 4 to 17 acres of upslope, off-site drainage area not under the control of K Hovnanian at Northampton, LLC also contributes storm water to the sedimentation basin. The offsite land use consists of wooded open space and a residential development. The sample location of the discharge from SB-B is shown on Figure 6. Automatic storm water sampling units with automatic flow meters will be installed at each sample location. In addition, automatic rain gauges will be installed at each site. The sample locations will be situated before the discharge reaches any surface water and after the discharge passes through the rip-rap following discharge from the sedimentation basin. If necessary, a channel will be constructed after the rip-rap pad to allow for the collection of storm water samples and the ability to record flow information. The channel will be armored to prevent erosion.

4.0 SAMPLING AND ANALYSIS PLAN

The Sampling Plan is the framework for all field activities and describes the methods that will be utilized to collect storm water and rainfall data throughout this investigation. Field activities conducted during this study will include measuring the amount of flow at each of the sampling locations, measuring the amount of rainfall at each development, and the collection of water quality samples at each sampling location. The following guidelines will be used when determining which storm events will be sampled and submitted for analysis during the two-month time period:

1. Storm water samples will only be submitted for analysis if the storm event produces a sufficient volume of discharge for hourly samples to be collected for the first six hours of the storm event starting from the ability to measure flow from the armored channel.
2. Events to be sampled will be preceded by at least 24 hours of dry weather between storm events.

4.1 Flow Data

Automatic flow meters will be installed downgradient and in close proximity to the outfall of each basin. The flow meters will be programmed to record the flow data when each sample is collected. Product information for the type of equipment that will be used during the sampling activities is shown in the product information contained in Appendix A.

4.2 Rainfall Data

Rainfall data will be collected by one automatic tipping bucket rain gage to be setup at each development. The 'tipping bucket' mechanism tips with every 0.01 inch of rainfall. These units will measure the amount of rainfall, the date and duration of rainfall, and the time since the last event occurred. Product information for the type of equipment that will be used during the sampling activities is shown in the product information contained in Appendix A.

4.3 Sampling Protocol

An automatic sampling unit will be installed downgradient and in close proximity to the outfall of each basin. Product information for the type of equipment that will be used during the sampling activities is shown in the product information contained in Appendix A. The sample locations will be situated before the discharge reaches any surface water and after the discharge passes through a rip-rap pad. A storm water sample shall be collected each hour, for the first six hours of the storm event, starting within 30 minutes of the beginning of the measured discharge for each storm sampled. After the storm event, the samples will be removed from the automatic sampling unit by LBG personnel within 24-hours and placed into an ice-filled insulated cooler for transportation to the Analytical Laboratory Services, Inc. (ALSI) located in Middletown, Pennsylvania. ALSI is a NELAP accredited laboratory and is licensed in Pennsylvania (PA License No. 22-293).

Because of the automatic nature of the sampling unit, and the variability and unpredictability in the weather, we will not be able to provide the USEPA with 72-hour advance notice of the sampling.

4.4 Water Quality Data

The samples will be analyzed at ALSI for concentrations of total suspended solids (TSS) in milligrams per liter (mg/L) at 0.45 microns (μm) and larger by USEPA Method 160.2. Total dissolved solids (TDS) will be analyzed for concentrations in mg/L below 0.45 μm by USEPA Method 160.1.

5.0 QUALITY ASSURANCE/QUALITY CONTROL OBJECTIVES

5.1 Data Quality

The procedures described herein were developed to provide reliable and accurate data, and will be implemented for field sampling, field handling and sample submission to ALSI. To assess the quality assurance and quality control (QAQC) of the data resulting from the field sampling program, field blank and field duplicate samples will be collected and submitted to ALSI. One field blank and one field duplicate blank will be collected during each storm event.

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(10) 430-
7764

The field blank sample will be analyzed to assess sampling and analytical reproducibility. The field duplicate sample will be analyzed to evaluate analytical accuracy and precision.

5.2 Data Management

The data to be developed during the monitoring activities can be grouped into three major categories: flow data, rainfall data and water quality data. Data will be presented using Microsoft Excel and all text will be presented using Microsoft Word. Electronic versions of documents will be made available on a compact disc.

5.2.1 Sample Designation

The sample numbering system will include the sample location designation (BS for Byers Station and NH for Woods at Northampton), the storm designation identifier (01 through 04), and the sample number designation (01 through 07). An example of the second storm water sample collected from Byers Station during the third storm event would be BS0302.

5.2.2 Sample Handling and Custody Requirements

Each storm water sample will be pumped into a laboratory-provided 500 milliliter (ml) plastic bottle by the automatic sampling units. Once the samples have been removed from the sampling unit by LBG, the samples will be stored in an ice-filled insulated cooler and delivered to ALSI. The samples will be analyzed for the parameters defined in Section 4.4.

One field blank sample and one field duplicate sample will be prepared and submitted for laboratory analysis during each sampling event to evaluate the integrity of the samples during transit and the reproducibility of the sampling and analytical procedures. The field duplicate will be collected in the field by the automatic sampling unit. The field blank will be collected by LBG at the end of the storm event by pumping laboratory-supplied analyte-free water through the automatic sampling unit. The sample shipment will be documented using a chain-of-custody form that will be signed at each relinquishment.

5.2.3 Field Data Records

In the field, LBG will record the following information in a field logbook for each sample

event:

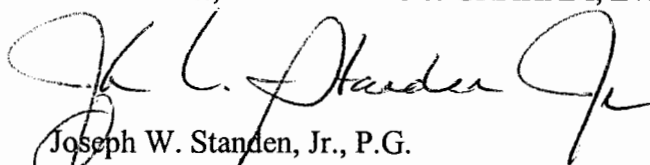
- Name of LBG representative;
- Time and volume of flow in gallons per minute;
- Date of sampling;
- The location, description and condition of all erosion and sedimentation control and treatment processes in place in the area which drains to the sampling location at the time of sampling;
- A description and location of the construction activity occurring in the area draining to the sampling location at the time of sampling.

5.3 Reporting

A report will be prepared that provides a description of all the activities that were completed for the monitoring task and a summary of the data that were collected. All rainfall, water quality, and flow data will be tabulated and the data will be provided on a compact disc to the USEPA.

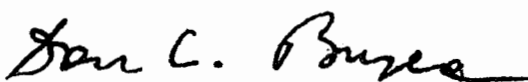
Very truly yours,

LEGGETTE, BRASHEARS & GRAHAM, INC.



Joseph W. Standen, Jr., P.G.
Associate

Reviewed by:



Dan C. Buzea, CPG
Vice President

Isco 6712 Full-size Portable Sampler

Isco's 6700 Series Portable Samplers have set the industry standard, providing the most comprehensive and durable performance available. With the introduction of our new 6712, Isco takes another step toward the ultimate by including SDI-12 interface capabilities.

The 6712 uses Isco's advanced 6700 Series Controller, a device that allows you to select from a variety of programming modes, assuring the most suitable routine for your application. Programming is fast and simple, with on-line help just a key stroke away.

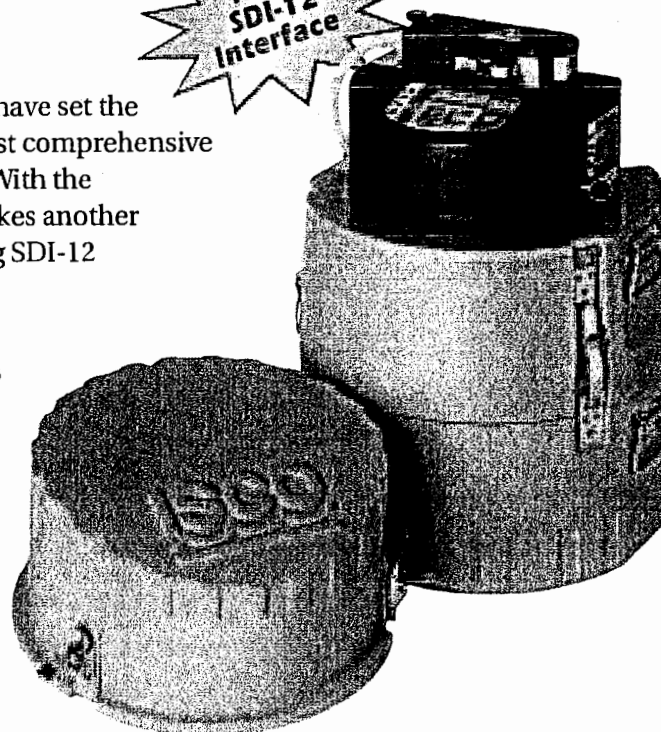
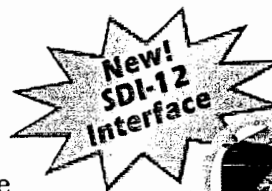
The environmentally-sealed 6712 controller delivers maximum accuracy and easily handles all of your sampling applications, including:

- ▶ wastewater effluent
- ▶ stormwater monitoring
- ▶ CSO monitoring
- ▶ permit compliance
- ▶ pretreatment compliance

In the Standard Programming Mode, the controller walks you through the sampling sequence step-by-step, allowing you to choose all parameters specific to your application. Selecting the Extended Programming Mode lets you enter more detailed programs.

An optional telephone modem allows programming changes and data collection to be performed remotely, from a touch-tone phone. It also has dial-out alarm features.

Bottle options are available for practically any sequential or composite application.



Versatile and Convenient

With eleven bottle choices, Isco's 6712 Sampler lets you quickly adapt for simple or intricate sampling routines. Up to 30 pounds (13.5 kg) of ice fits in the insulated base, preserving samples for extended periods, even in extreme conditions. A convenient drain plug aids removal of water from melted ice.

Tough and Reliable

The 6712 Portable Sampler features a vacuum-formed ABS plastic shell to withstand exposure and abuse. Its tapered design and trim 20-inch (50.8 cm) diameter result in easy manhole installation and removal. Large, comfortable handles make transporting safe and convenient—even when wearing gloves.

Isco's 6712 Portable Sampler carries a NEMA 4X, 6 (IP67) enclosure rating. It's submersible, watertight, dust-tight, and resistant to sleet and corrosion.

Superior capability, rugged construction, and unmatched reliability make the 6712 the ideal choice for portable sampling in just about any application.

All 6712 Samplers share the following features:

Advanced Delivery System

The 6712's peristaltic pump delivers samples at the EPA-recommended velocity of 2 ft/sec., even at head heights of 26 feet. At a head height of 3 feet, line velocity is 3 ft/sec. No other automatic sampler achieves this level of performance!

Our patented* pump revolution counter tells you when tubing should be replaced. Changing tubing is a snap; there are no pump covers, collars or tools to slow you down. An exclusive safety interlock removes power from the pump when it's opened.

Step-by-Step Programming

This feature walks you through the sampling sequence and allows you to choose all parameters specific to your application:

- ▶ When to start
- ▶ What volume to collect
- ▶ How to distribute samples
- ▶ If samples are to be time- or flow-paced.

You can easily enter complex programs to suit your unique needs. Available routines include:

- ▶ Pause and resume for intermittent discharge flow monitoring
- ▶ Sampler pacing by time, non-uniform time, flow or external event
- ▶ Random interval sample collection

Convenient Data Retrieval

Every 6712 Sampler is also a powerful data logger. Sampling, flow, rainfall, and other water quality data can be stored in its 512 KB memory.

Data may be retrieved directly into a Flowlink® 4 equipped PC in three ways:

- ▶ Via cable connection
- ▶ Remotely, via Isco's 2102 Wireless Communication System
- ▶ By phone, using our optional built-in modem

SDI-12 Interfacing

The 6712 functions as a SDI-12 logger and connects to any sensor that fully implements the protocol standard.



Display window showing SDI-12 connection status.

In addition, Isco has defined extended commands to enable "plug and play" communications and ease of programming. These commands are implemented by the sensor manufacturer. Data are identified and logged by their specific type.

Expand your monitoring capabilities with these products and accessories.

Contact Isco or your Isco Representative to receive specific literature and prices on the following items.

Telephone Modem

A factory-installed option that lets you set up and make programming changes, or collect data from your 6712 sampler from the comfort of your office.

581 RTD (Rapid Transfer Device)

Slim enough to fit in your shirt pocket, yet rugged enough to withstand submersion, the 581 RTD lets you quickly retrieve and transfer data without taking your laptop computer into the field.



ProPak™ Disposable Sample Bags

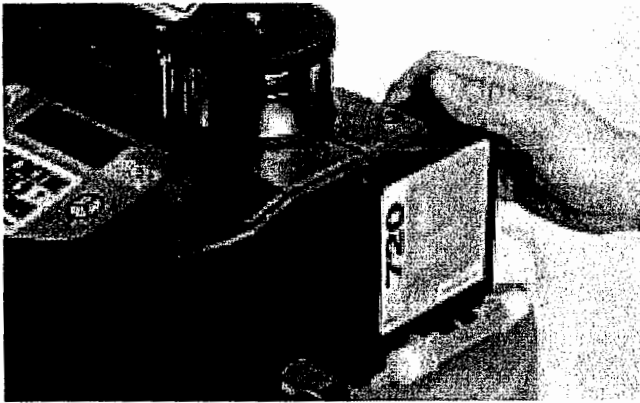
Isco's patented ProPak bags eliminate the expense of washing and storing bottles, while taking away worries about contamination from previous samples. The bags are available with a 1000 ml capacity, or in a 2-gallon version for composite sampling.

Flowlink Software

Isco's advanced Flowlink® 4 for Windows Data Management Software harnesses the power of Microsoft Windows® to retrieve, import, compare, and analyze data, generate advanced charts and graphs, create comprehensive reports, and more.

700 Series Modules

Our interchangeable 700 Series Modules let you adapt your 6712 sampler for a variety of jobs. These compact modules are environmentally sealed and may be added to your 6712 system at any time.



701 – pH and Temperature Module

Combines accurate pH and temperature monitoring in one module. It will also activate your 6712 Sampler at a user-elected pH or temperature range.

710 – Ultrasonic Flow Module

Uses our field-proven ultrasonic level sensor that doesn't require submersion in the flow stream.

720 – Submerged Probe Flow Module

Provides accurate measurement at sites where wind, steam, foam, turbulence, or air temperature fluctuations exist. Suitable for small channels, it accurately senses pressure even when covered with silt and sand.

730 – Bubbler Flow Module

Get the dependability and accuracy of Isco bubbler flow meters in a miniaturized package. The 730 is unaffected by changing stream conditions, and level measurement remains accurate despite temperature fluctuations or exposure to harsh chemicals.

750 – Area Velocity Flow Module

Gives greater accuracy where weirs and flumes are not practical, and where submerged, full pipe, surcharged, and reverse flow conditions may occur. And, you don't have to estimate the slope and roughness of the channel.

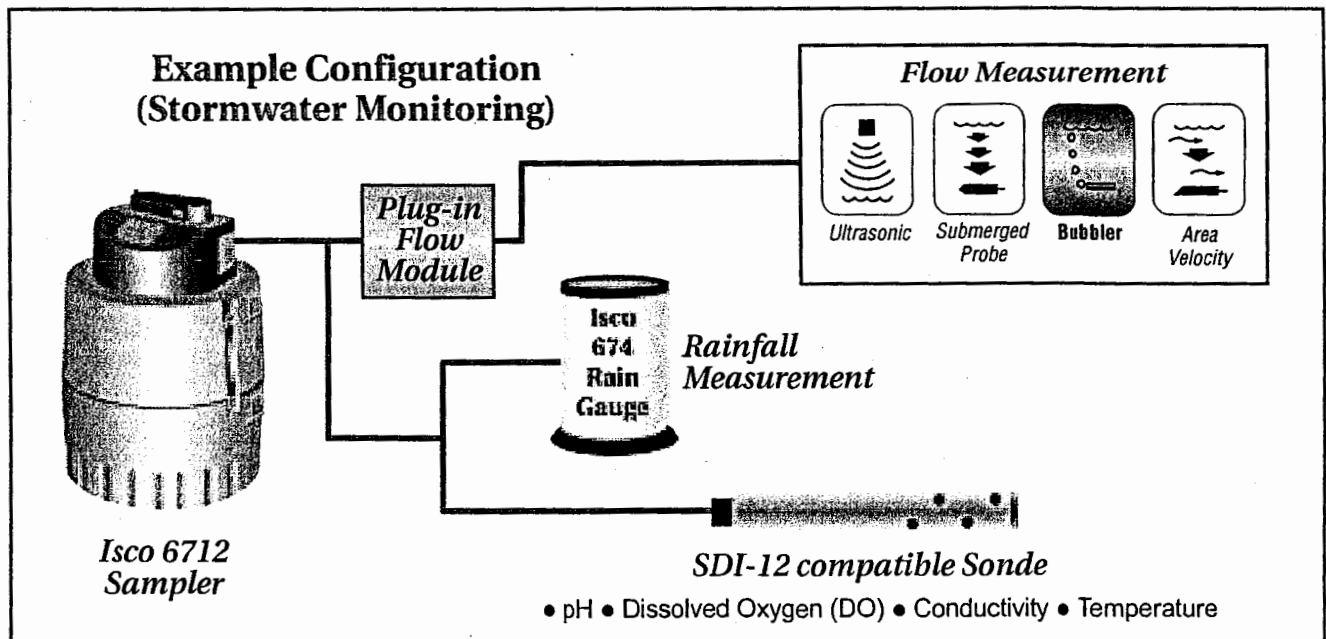
780 – Smart 4-20 Module

Add intelligence to a simple analog signal. Flow rates are displayed in actual volume units, not merely a percent of full scale. Any linear 4-20 mA input can be characterized by using the 780. The information can be stored and retrieved for later analysis.

Integrated Water Monitoring

Isco 6712 Samplers feature "plug and play" connection with SDI-12 compatible measuring devices - including multi-parameter sondes from leading manufacturers. Combined with the 6712's standard 512 KB of memory, enough for more than

200,000 stored readings. SDI-12 networking gives you great flexibility for logging environmental data, and for "smart sampling" event notification, triggered on any combination of up to 16 inputs.



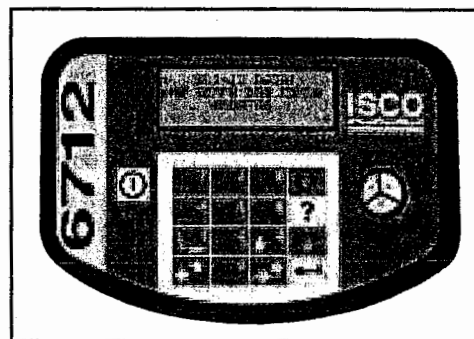
Isco 6712 Full-size Portable Sampler Specifications

Sampler			Controller		
Height	27.0 in.	68.6 cm	Weight	13 lbs.	5.9 kg
Diameter	20 in.	50.7 cm	Dimensions	10.3 x 12.5 x 10 in.	26 x 31.7 x 25.4 cm
Weight (Dry/Less Battery)	32 lbs.	15 kg	Operational Temperature	32° to 120°F	0° to 49°C
Material	High-strength ABS plastic outer shell Stainless steel hardware		Enclosure Rating	NEMA 4X, 6	IP67
Power Requirements	12 VDC		Program Memory	Non-volatile flash memory	
Pump			Flow Meter Signal Requirements	5 to 15 volt DC pulse or 25 millisecond isolated contact closure.	
Intake Purge	Adjustable air purge before and after each sample.		Number of Programmable Composite Samples	1 to 999 samples or continuous sampling	
Tubing Life Indicator	Provides a warning to change pump tubing.		Real Time Clock Accuracy	1 minute per month, typical	
Intake Suction Tubing			Software		
Length	3 to 99 ft.	1 to 30 m	Sample Frequency Selection	1 minute to 99 hours 59 minutes, in 1 minute increments. Non-uniform times in minutes or clock times 1 to 9,999 flow pulses	
Material	Vinyl or Teflon® lined		Sampling Modes	Uniform time, non-uniform time, flow. <i>(Flow mode is controlled by external flow meter pulses.)</i>	
Inside Dimension	¾ in.	1 cm	Programmable Sample Volumes	10 to 9,990 ml in 1 ml increments	
Pump Tubing Life	Typically 1,000,000 pump counts		Sample Retries	If no sample is detected, up to 3 attempts; user selectable	
Maximum Suction Lift	28 ft.	8.5 m	Rinse Cycles	Automatic rinsing of suction line up to 3 rinses for each sample collection	
Typical Repeatability	±5 ml or ±5% of the average volume in a set		Program Storage	5 sampling programs	
Typical Line Transport Velocity at head heights of:			Sampling Stop/Resume	Up to 24 real time/date sample stop/resume commands	
	3 ft. (0.9 m)	3.0 ft./s	0.91 m/s	Controller Diagnostics	Tests for RAM, ROM, pump display, and distributor
	10 ft. (3.1 m)	2.9 ft./s	0.87 m/s		
	15 ft. (4.6 m)	2.7 ft./s	0.83 m/s		
Liquid Presence Detector	Non-wetted, non-conductive sensor detects when liquid sample reaches the pump to automatically compensate for changes in head heights.				

Ordering Information

Description	Part Number
6712 Portable Sampler, Full-size Includes controller with 512 KB RAM, top cover, center section, base, distributor arm, instruction manual, pocket guide.	68-6710-070
6712 Portable Sampler with Jumbo Base (as described above)	68-6710-082

Note: Power source, bottle configuration, suction line, and strainer must be ordered separately. Other options and accessories are also available. Contact Isco or your Isco Representative for complete information.



The 6712 Controller is an SDI-12 logger. Manual pump operations are now located on the front panel keys.



Isco, Inc.
4700 Superior St.
Lincoln, NE 68504 USA
Phone: (402) 464-0231
USA & Canada: (800) 228-4373
Fax: (402) 465-3022
E-Mail: info@isco.com

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Glossary

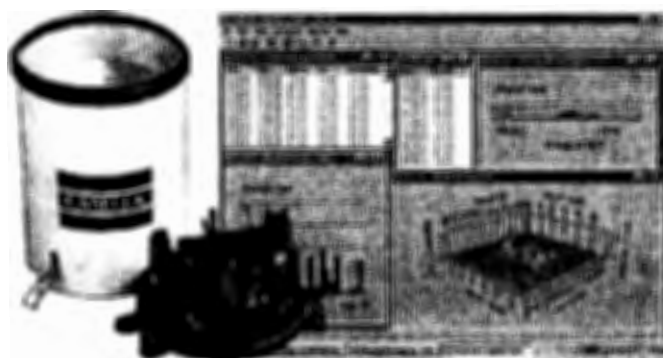
Unsure of any of the terms used
to describe our products?

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Product Wizard

Find the right product by
answering some simple
questions.



Rainfall Logging System with software and
communications cable 0.1mm (light rainfall)

Part Number 103553D

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The Casella CEL Rainfall Logging System utilises the Tipping
Bucket Rain Gauge with an in-built datalogger. The system enables
rainfall data to be recorded and stored in the memory as real-time
information.

Once measured, the rain water is automatically discharged from
the rain gauge and therefore does not overflow when left for long
periods of time. The rainfall data is transferred from the logger
using a PC or laptop. PC software and a communication lead are
provided with each system, enabling the user to produce daily and
monthly tables and histograms.

An internal alkaline battery, having a typical life expectancy of up to
3 years, is used to power the system. A lithium battery provides
protection of the logged data in the event of main battery failure or
replacement. The datalogger is only active during actual rainfall
and remains dormant during dry spells to conserve both memory
and main battery reserves. During rainfall periods, data will be
recorded with a time resolution of one minute and presented as
total rainfall occurring within the given minute.

For example if the logger of a 0.2mm model logs 3 tips in 1 minute,
it will show a result of 0.6mm rainfall for that minute. The memory
has the capacity for almost 100 hours of continuous rainfall.

Applicable Standards

BS 7843 Guide to acquisition and management of MET
precipitation data recorders parts 1 and 2

WMO commission for instruments and methods of observation No.
727

Integral application software

Casella CEL Integral application software provides users of Casella

[Specification](#)
[Handbook](#)
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Want more

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CEL rainfall logging systems with a powerful and versatile Windows program for the accumulation, processing and presentation of rainfall data. It can also import data from Casella's current RLS application (which it replaces).


Once data has been downloaded from a logger it provides a large number of ways to view / interrogate the data.

The Rainfall Logging System application allows you to view rainfall data in three different tabular formats, and three different graphical formats. All of which can be printed or copied into a word processor package to produce reports. It can also calculate rainfall totals and the maximum hourly rainfall rate.

Main data views:

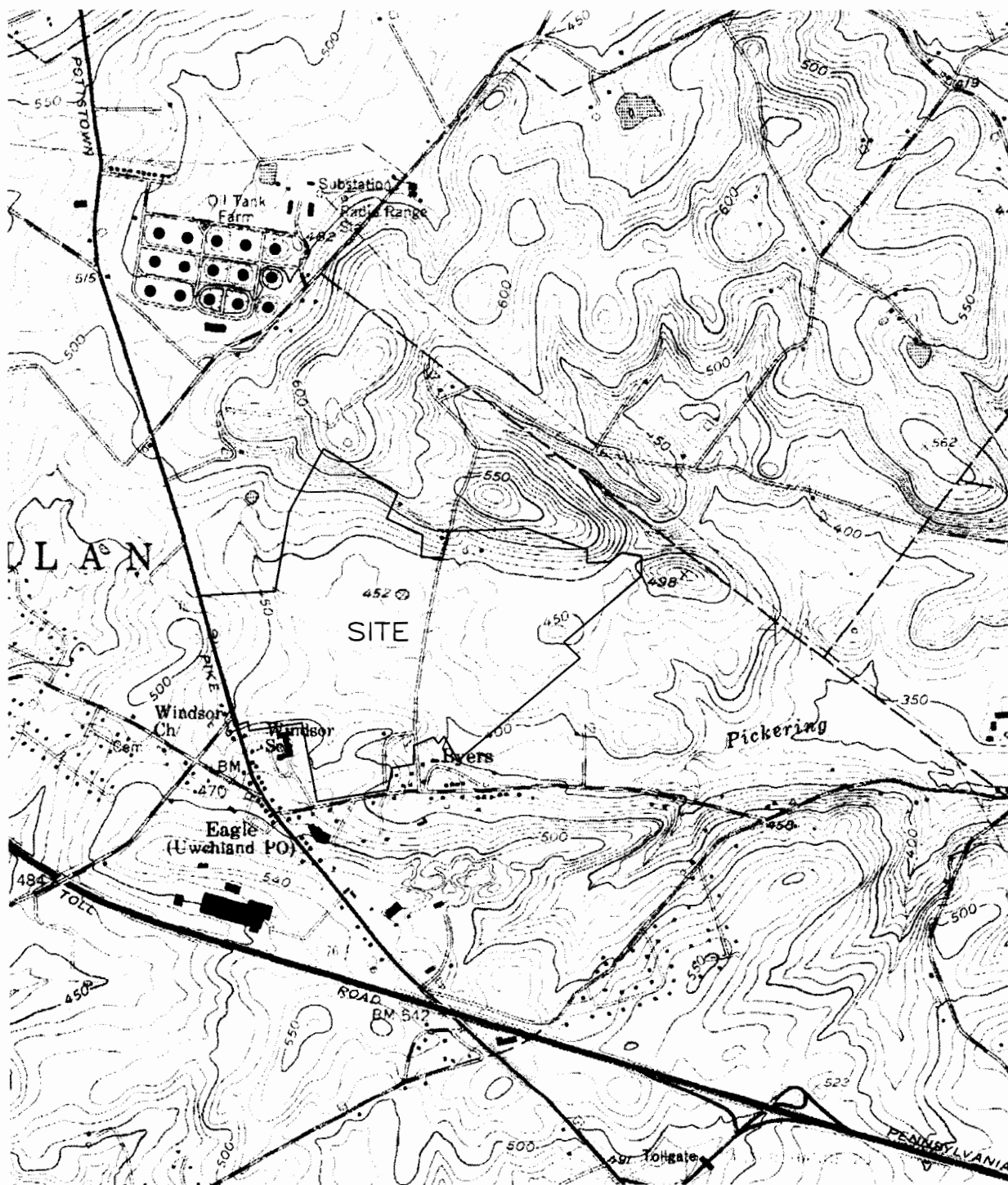
- Summary
- Minute table
- 15 Minute table
- Hour table
- Day table
- Daily hour histogram
- Month day histogram
- Month hourly rain graph

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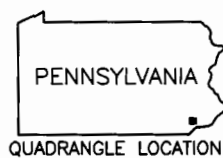
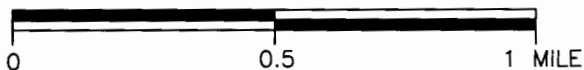
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Casella CEL. A division of CASELLATE Group
www.casellagroup.com

Think environment



SCALE



COPIED FROM ORIGINAL OF U.S.G.S. 7.5 MINUTE
DOWNTOWN, PENNSYLVANIA, QUADRANGLE

K. HOVNANIAN AT UPPER UWCHLAN, LLC
BYERS STATION
UPPER UWCHLAN TOWNSHIP
CHESTER COUNTY, PENNSYLVANIA

SITE LOCATION MAP

DATE

REVISED

PREPARED BY:

LEGGETTE, BRASHEARS & GRAHAM, INC.

Professional Ground-Water and Environmental Engineering Services

426 Brandywine Parkway

West Chester, PA 19380

(610) 430-7764

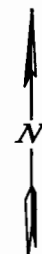
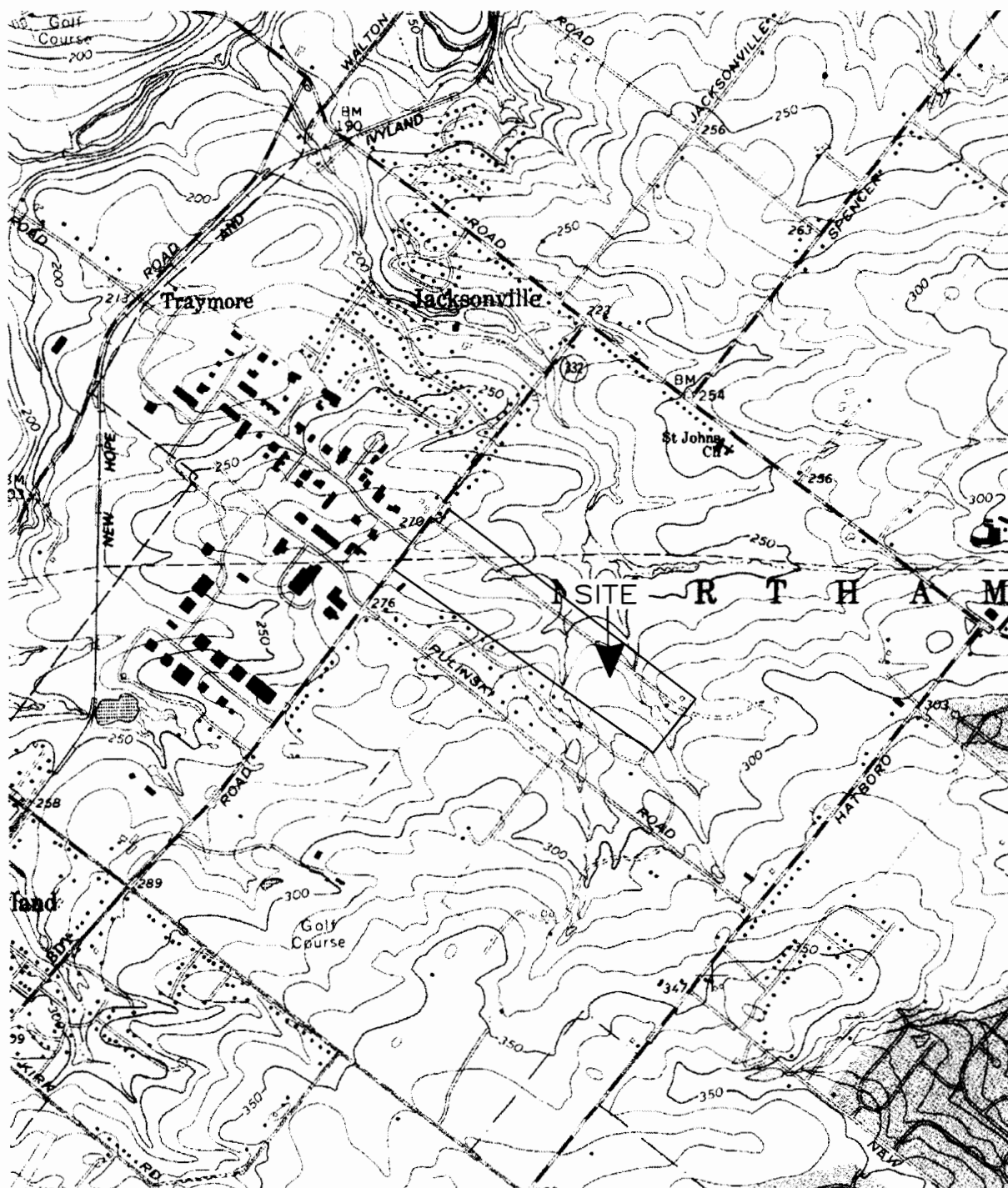


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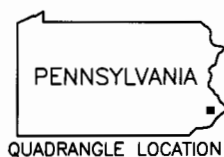
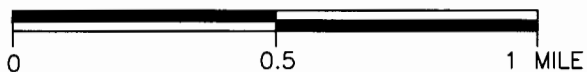
CHECKED: JS

DATE: 4/20/05

FIGURE: 1



SCALE



COPIED FROM ORIGINAL OF U.S.G.S. 7.5 MINUTE HATBORO, PENNSYLVANIA, QUADRANGLE

K. HOVNANIAN AT NORTHAMPTON, LLC
THE WOODS AT NORTHAMPTON
NORTHAMPTON TOWNSHIP
BUCKS COUNTY, PENNSYLVANIA

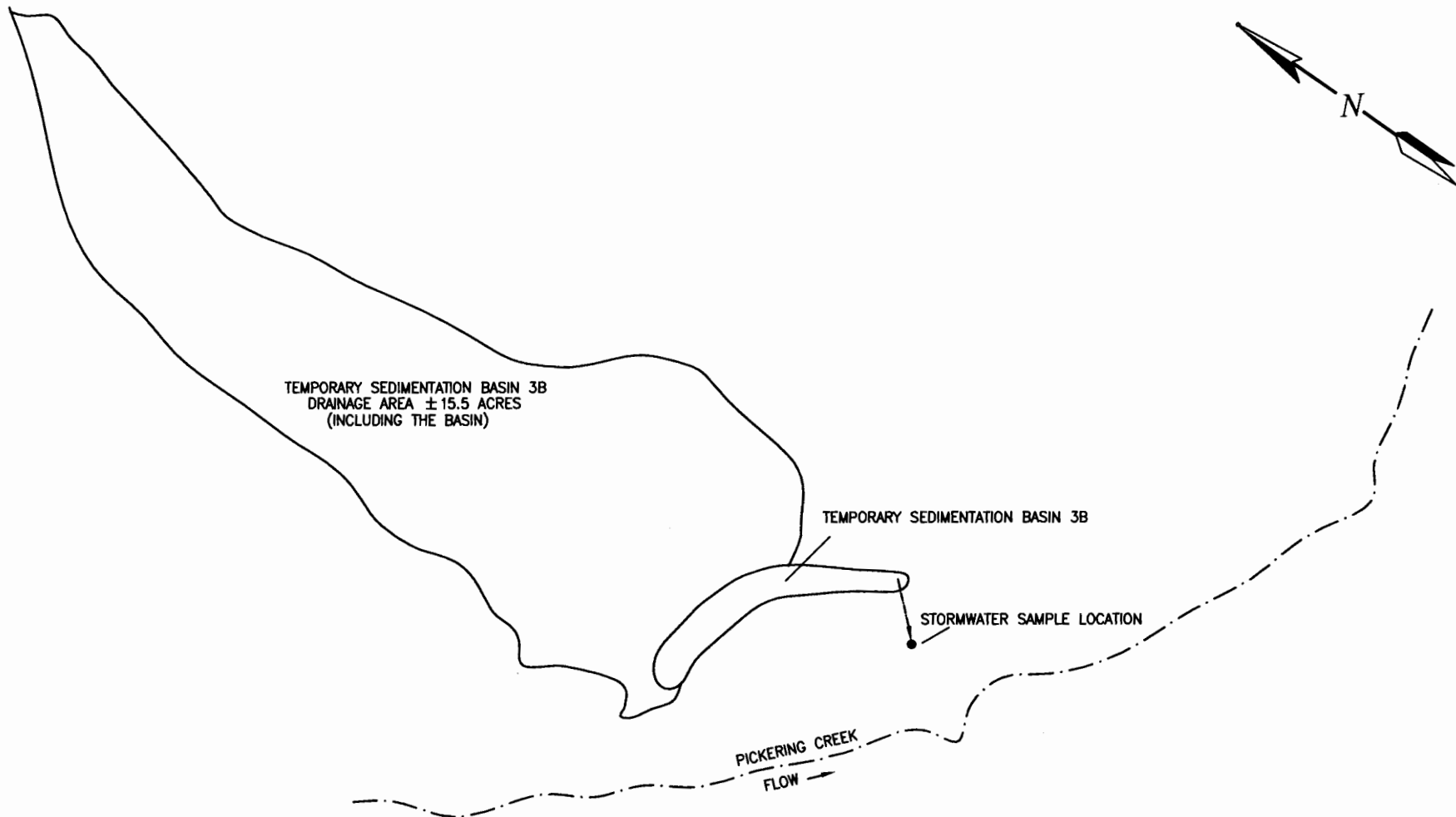
SITE LOCATION MAP

DATE	REVISED

PREPARED BY:
LEGGETTE, BRASHEARS & GRAHAM, INC.
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West Chester, PA 19380
(610) 430-7764




DRAWN:	GM	CHECKED:	JS	DATE:	4/20/05	FIGURE:	2
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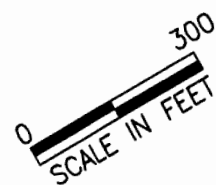


0 300
APPROX. SCALE IN FEET

K. HOVNANIAN AT UPPER UWCHLAN, LLC
BYERS STATION
UPPER UWCHLAN TOWNSHIP
CHESTER COUNTY, PENNSYLVANIA

STORMWATER SAMPLE LOCATION FOR TEMPORARY
SEDIMENTATION BASIN 3B

DATE	REVISED	PREPARED BY:
		LEGGETTE, BRASHEARS & GRAHAM, INC.
		Professional Ground-Water and Environmental Engineering Services
		426 Brandywine Parkway
		West Chester, PA 19380
		(610) 430-7764
		
DRAWN:	GM	CHECKED: JS
		DATE: 4/18/05
		FIGURE: 5



**K. HOVNANIAN AT NORTH
THE WOODS AT NORTH
NORTHAMPTON T
BUCKS COUNTY, PE**

STORMWATER SAMPLE LOCATION

DATE	REVISED	PREPARED BY
DRAWN: GK		CHECKED:

